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Mapping, Monitoring and Management plan of waterbodies of Lucknow district, Uttar Pradesh

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ABSTRACT:

Restoration of the waterbodies should be necessary to sustain habitat and maintain ecological balance. The main root cause of degradation is really important to understand since better understanding of it may help the restoring team to eradicate that problem for the better results. It can't be sustained if the stakeholders are not considered in the plan. Educating them about the importance of the restoration of the river is really important step towards achieving the goal. Stakeholder's understanding for protection and rejuvenation of the waterbodies may turn out to be the foremost reason for positive outcome of restoration. Based upon the region, diverse satellite sensors have been utilized for water bodies monitoring. Consequently, moderate goal information from Landsat 8 has been utilized for water asset the executives' applications, NDWI have been utilized for water bodies extraction.

Introduction:

Water is the most discussed point all around the world and a plenty of deals and shows have lauded its feasible employments (Sharma Et al. 2003). It has been around since days of yore. Waterbodies mapping and management is important since it supports the life (Sharma Et al. 2003).. A test to estimating and observing water quality in situ is that it can be restrictively costly and tedious. An elective technique to screen water quality is by utilizing satellite images (Ward Et al. 1999). In the beyond couple of many years, remote sensing procedures and abilities have been read up for observing waterbodies (Ward Et al. 1999). Water Bodies are vital element in the scene. They are fundamental in the hydrological serious conditions like dry spell and floods, they impact the miniature environment just as improve the stylish excellence of the scene and deal different sporting open doors (Ward Et al. 1999). The Water Bodies in metropolitan regions give a variety of qualities and utilizations going from biological labour and products to coordinate creation esteems. The put away water might be utilized for wasteful reason as well as non-wasteful use like water system, fishing, ecotourism, and so on these are too sites of artistic, religious and spiritual pursuits. These are essentially relevant social benefits (Nilsson et al.2005). Therefore, the need to initiate efforts to restore, conserve, manage and maintain the lakes as an inseparable part of the whole eco system cannot be undermined Water shortage is a theoretical idea to numerous and an obvious reality for others. It is the aftereffect of bunch ecological, political, monetary, also, friendly powers (Nilsson et al.2005). While almost 70% of the world is covered by water, just 2.5 percent of it is new water. Just 0.007 percent of the planet's water is accessible to take care of its 6.8 billion individuals. In the creating nations, clean water is either difficult to find or a product that requires difficult work or huge cash to acquire (Wohl Et al 2005). The scene of India is spotted with enormous number of lakes, supplies and wetlands. All things considered, the lakes have fulfilled water needs of the populace for quite a long time and a local area the board framework had supported them for a extensive stretch of time. Based upon the region, diverse satellite sensors have been utilized for water bodies monitoring. Consequently, moderate goal information from Landsat 8 has been utilized for water asset the executives' applications, Landsat-8 have been utilized for water bodies extraction.

Material and Methods:

Study Area:

When the river Bhagirathi flowing from Gaumukh joins the river Alaknanda, Ganga comes into existence. Ganga is the holy river of Indian subcontinent flowing from Himalayas, travelling various states of the northern plain of the country and merging into Bay of Bengal. As mentioned, it flows through various states such as Uttar Pradesh, Bihar, West Bengal with tributaries and distributaries on its way. One of the major tributaries of Ganga is Gomati which originates from Uttar Pradesh. Gomati originates from Mainkot's lake The FulharJheel, Uttar Pradesh and travels about 32 miles east of Pilibhit and is intermittent for the first 35 miles of its course, becoming perennial after its junction with the Joknai.

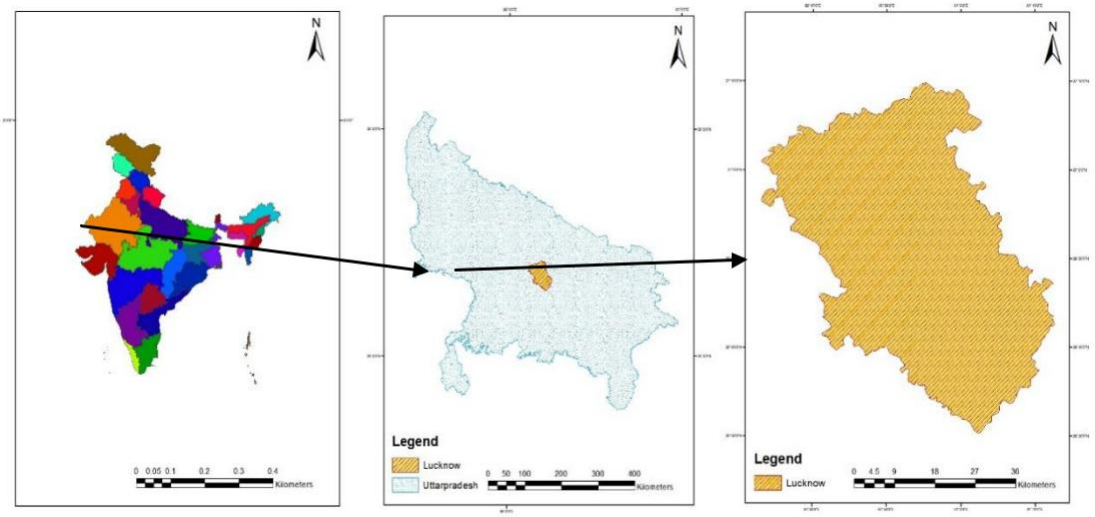


Figure1: study area

Below this point it flows generally southeast for about 500 miles and merging in to ganga near Saidpur. It drains a basin of about 7240 square miles. Major cities located on the bank of river are Lucknow, Sultanpur and Jaunpur. Lucknow, the capital city of Uttar Pradesh with a population of about 2,541,101 population (census report 2001) is situated on the bank of river Gomati. Tributaries of Gomati are Akhadinala, Jhilinginala, Behtanala, Loninala and Kukrailnala (retrieved from irrigation and water resource department, Lucknow, Uttar Pradesh). The environment of the area differs between sub-moist to semi-dry tropical. The normal yearly precipitation is 100 cm, and around 85% of it happens during the storm season. July and August get almost 55% of the complete yearly precipitation (CPCB, 2002). Today it is a seasonal rivulet fed only with drained water during excessive rain mainly in rainy season. During excessive rains there are cases of water logging in breeding enclosure.

Satellite sensor and image selection:

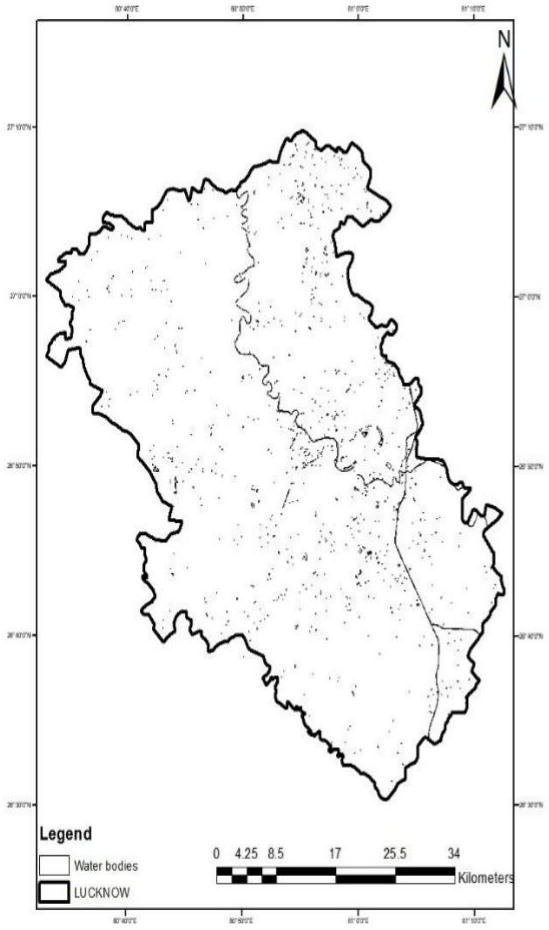
Landsat 8 is an Earth perception satellite constructed, sent off and worked by a cooperation of NASA and USGS. Information study is performed by two fundamental sensors which are changed into recommended groups. The satellite works in apparent light, close to InfraRed; Shortwave InfraRed to Warm (Longwave) infrared. The groups are pre-set to 11 groups altogether contrasted by the frequency of their vision. One of the sensors - Functional Land Imager (OLI) involves 9 groups in the range of apparent light and Close to Infrared. The subsequent sensor - Warm InfraRed Sensor (TIRS) works in the scope of the Infrared frequencies - LongwaveInfraRed Light. The satellite gives pictures a moderate goal which fluctuates in various groups from 15 m for each pixel in the most dependable to 100 m in the Longwave Infrared where precision isn't fundamental.

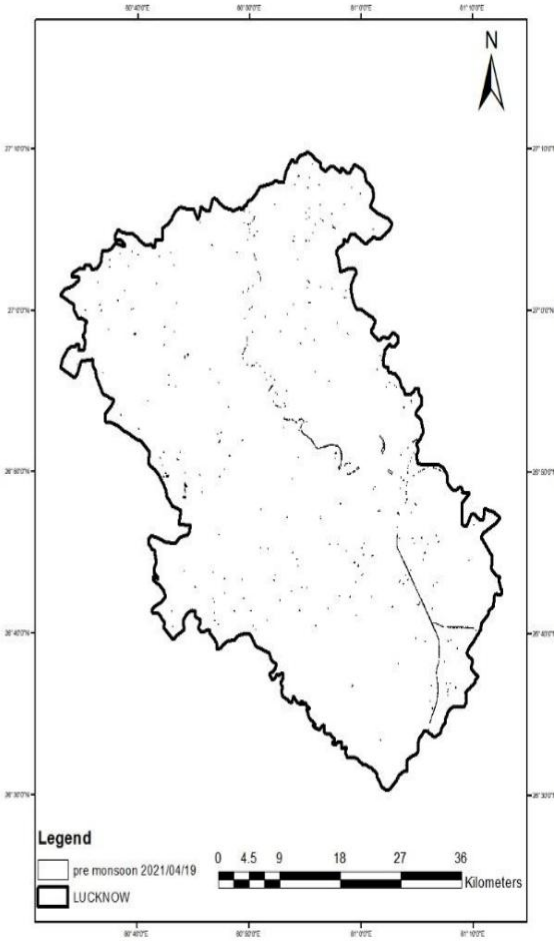
Table no. 1 Landsat data (OLI) Datawas used

Spectral Band	Use Area	Wavelength	Resolution
Band 1	Coastal/ Aerosol	0.433-0.453 µm	30m
Band 2	Blue	0.450-0.515µm	30m
Band 3	Green	0.525-0.600µm	30m
Band 4	Red	0.630-0.680µm	30m
Band 5	Near Infrared	0.845-0.885µm	30m
Band 6	Short Wavelength Infrared 1 (SWIR 1)	1.560-1.660µm	30m
Band 7	Short Wavelength Infrared 2 (SWIR 1)	2.100-2.300µm	30m
Band 8	Panchromatic	0.500-0.680µm	15m
Band 9	Cirrus	1.60-1.390µm	30m
Band 10	Long Wavelength I.R.	10.30-11.30µm	100m
Band 11	Long Wavelength I.R.	11.50-12.50µm	100m

NDWI Calculation:

The Normalized Difference Water Index (NDWI) was first proposed by McFeeters in 1996 to recognize surface waters in wetland conditions and to take into account the estimation of surface water degree [19]. The NDWI is determined utilizing Condition (3): where Band 3 is the TOA green light reflectance and Band 5 is the TOA close infrared (NIR)reflectance. McFeeters [19] attested that upside of NDWI more prominent than zero are accepted to address water surfaces, while values not exactly, or equivalent, to zero are thought to be non-water surfaces. Values of NDWI were determined from the satellite pictures utilizing equation in the Raster Calculator® instrumenting the Spatial Analyst® expansion in ArcGIS® 10.0.
NDWI = (Green- NIR)/(Green+NIR)
BAND USED: BAND3(GREEN) BAND5(NIR)





Result and Discussion:

Figure 2: waterbody in 2014

Figure 3: Pre monsoon data

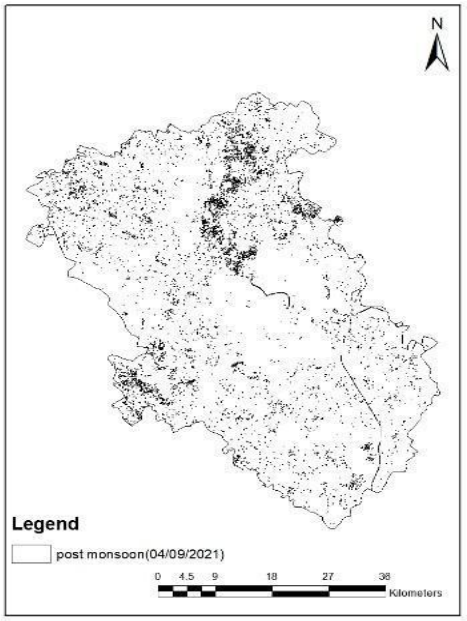


Figure:4 Post monsoon data

Table no. 2

Serial number	Waterbody category	No. of waterbody	Total area (ha)	Open water (area in ha)	
				Pre monsoon	Post monsoon
1	Lakes/Ponds	67	1948	471	687
2	Oxbow lake	50	1308	283	251
3	Riverine wetlands	1	3	3	0
4	Water logged	21	385	17	186
5	River/stream	61	2073	1850	1968
6	Reservoirs/Barrages	1	193	39	112
7	Tanks/Ponds	102	908	198	297
8	Waterlogged	90	2014	837	1589
9	Waterbodies (<2.25ha),mainly tanks	775	775		
10	**Total**	**1168**	**9607**	**3698**	**5090**

The area totally covered by waterbodies is 9607ha. Major waterbodies like lakes/ponds, river/stream, oxbow lake etc are natural waterbodies. Major manmade waterbodies include tanks/ponds, waterlogged etc. About 775 waterbodies covered an area of <2.25ha which highly include ponds.

Conclusion

Water bodies are the source of life. They maintain the ground water level, the provide habitat for various organism, maintain ecological balance but due globalization, urbanization and economic development waterbodies are getting extinct. Waterbodies maintain the temperature of the certain area. With the extinct of waterbodies, the temperature of land increases eventually linking to climate change. Various steps can be taken to manage the waterbodies of the area: The first and foremost important step is to educate the stakeholders and citizens of the area the importance of the waterbodies. If they are aware of the need for sustaining the waterbodies it becomes easy for further restore the waterbodies. Undertaking long term and natural approach towards the restoration is necessary for actual restoration of waterbody without establishing cemented areas around waterbodies. Government and policy makers should be transparent and empowered of all the stakeholders so as to protect the waterbodies. They should be protected and fenced by any kind of encroachments. The inlets and outlets of waterbodies should be timely. Untreated sewage should not be discharged in the waterbodies. De-silting, de-weeding, aeration, reduction of nutrient, removal of floating and other invasive aquatic plant-species etc should be processed in regular pattern. Afforestation, drainage management etc should be included. Buffer areas should be developed near the waterbodies where no one should be allowed. Water quality of the area should be monitored in a regular manner.

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List all the material used from various sources for making this project proposal

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